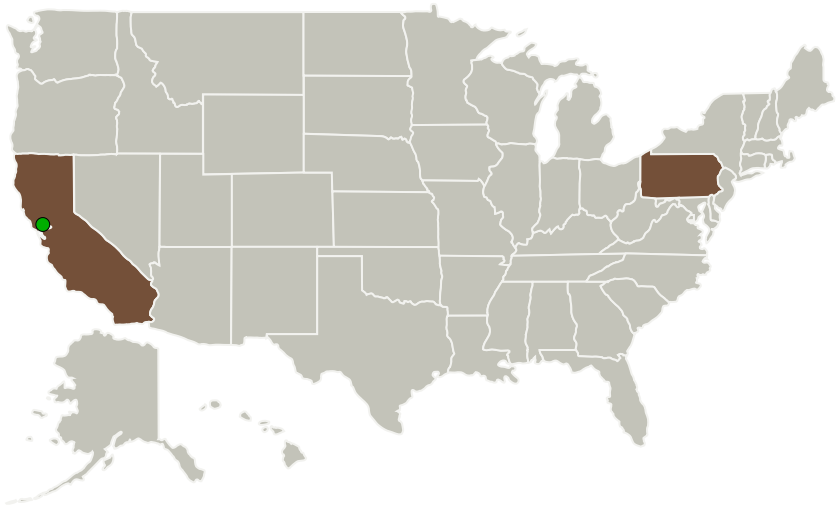
Unified Representation for Collaborative Visualization of Planetary Terrain Data, Phase I

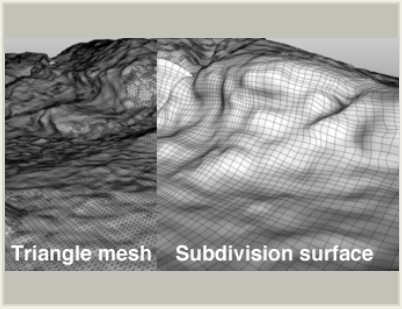
Completed Technology Project (2014 - 2014)

Project Introduction

We propose to apply to planetary terrain mapping an alternative, multiresolution method, subdivision surfaces (subdivs), in place of conventional digital elevation maps (DEMs) and fixed-resolution meshes. The proposed research is innovative in that it presents a new setting for subdivs that demands novel extensions to subdivision algorithms, techniques and theory. The primary objectives of this work are to: (1) demonstrate suitability of subdivs as a representation for terrain data with highly varied spatial resolution and 3-D features; (2) demonstrate their ability to encode, and later re-register, local detail non-destructively through hierarchical edits; and (3) prototype a software user interface introducing new capabilities enabled by the subdiv representation. The expected benefits are: (a) higher-fidelity terrain visualization with reduced infrastructure requirements; (b) ability to visualize 3-D features, such as overhangs, missed in DEM's; (c) compact encoding with natural level-of-detail control for interactive viewing even on mobile devices; (d) greater algorithmic efficiency for non-visualization scientific computation; and (e) enablement of new software-tool capabilities for dynamic mapping of alternative local-terrain datasets, non-destructive experimentation, collaboration, and data traceability. The innovation also promises capability and reliability benefits to a surface robot by unifying terrain representations and enabling minimal upload of only incremental terrain details from the ground.

Primary U.S. Work Locations and Key Partners





UNIFIED REPRESENTATION FOR COLLABORATIVE VISUALIZATION OF PLANETARY TERRAIN DATA Project Image

Table of Contents

Small Business Innovation Research/Small Business Tech Transfer

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Organizations Performing Work	Role	Type	Location
DigitalFish, Inc.	Lead Organization	Industry	San Mateo, California
Ames Research Center(ARC)	Supporting Organization	NASA Center	Moffett Field, California
Carnegie Mellon University	Supporting Organization	Academia	Pittsburgh, Pennsylvania

Primary U.S. Work Locations	
California	Pennsylvania

Project Transitions

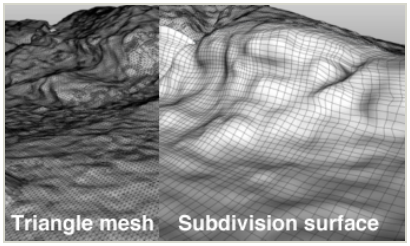
June 2014: Project Start

December 2014: Closed out

Closeout Documentation:

- Final Summary Chart*(https://techport.nasa.gov/file/137677)*

Images



Project Image
UNIFIED REPRESENTATION FOR COLLABORATIVE VISUALIZATION OF PLANETARY TERRAIN DATA
Project Image
(https://techport.nasa.gov/image/127789)

Organizational Responsibility

Responsible Mission Directorate:
Space Technology Mission Directorate (STMD)

Lead Organization:
DigitalFish, Inc.

Responsible Program:
Small Business Innovation Research/Small Business Tech Transfer

Project Management

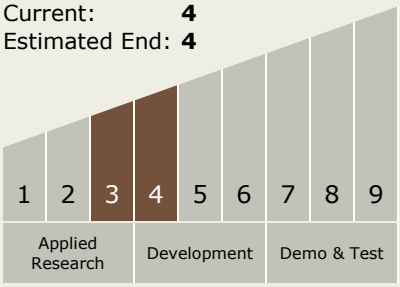
Program Director:
Jason L Kessler

Program Manager:
Carlos Torrez

Principal Investigator:
Daniel L Herman

Technology Maturity (TRL)

Start: **3**
Current: **4**
Estimated End: **4**



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Technology Areas

Primary:

- TX04 Robotic Systems
  - TX04.1 Sensing and Perception
    - TX04.1.3 Onboard Mapping and Data Analysis

Target Destinations

The Sun, Earth, The Moon, Mars, Others Inside the Solar System, Outside the Solar System